



Armed Forces College of Medicine

AFCM



Viral GIT infections

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INTENDED LEARNING OBJECTIVES (ILO)



By the end of this lecture the student will be able to:

1. Outline the structure of viruses causing GIT infections.
2. Describe pathogenesis & clinical presentation of viral GIT infections.
3. Outline laboratory diagnosis of viral GIT infections.
4. Outline prevention of viral GIT infections.

I-Infection of salivary glands

Mumps virus

II-Diarrhea

1. Rotaviruses

2. Norwalkviruses

3. Astroviruses

4. Adenoviruses

5. Coronaviruses

III-Hepatitis

Hepatitis viruses

COMMON CAUSES OF DIARRHEA- VIRUS

- ✓ *Rotavirus*
- ✓ *Human caliciviruses:* Norovirus spp.; Sapovirus spp.
- ✓ *Enteric adenoviruses*
- ✓ *Astroviruses,*
- ✓ *Coronaviruses,*

Mumps Virus



Structure

A - Family : Paramyxoviruses

B- Nucleocapsid

1-SS RNA

2-Helical

3- Nucleocapsid protein : S (soluble)Ag

C- Envelope : with 2 surface glycoproteins:

1-Bifunctional protein : Haemagglutinin-neuraminidase

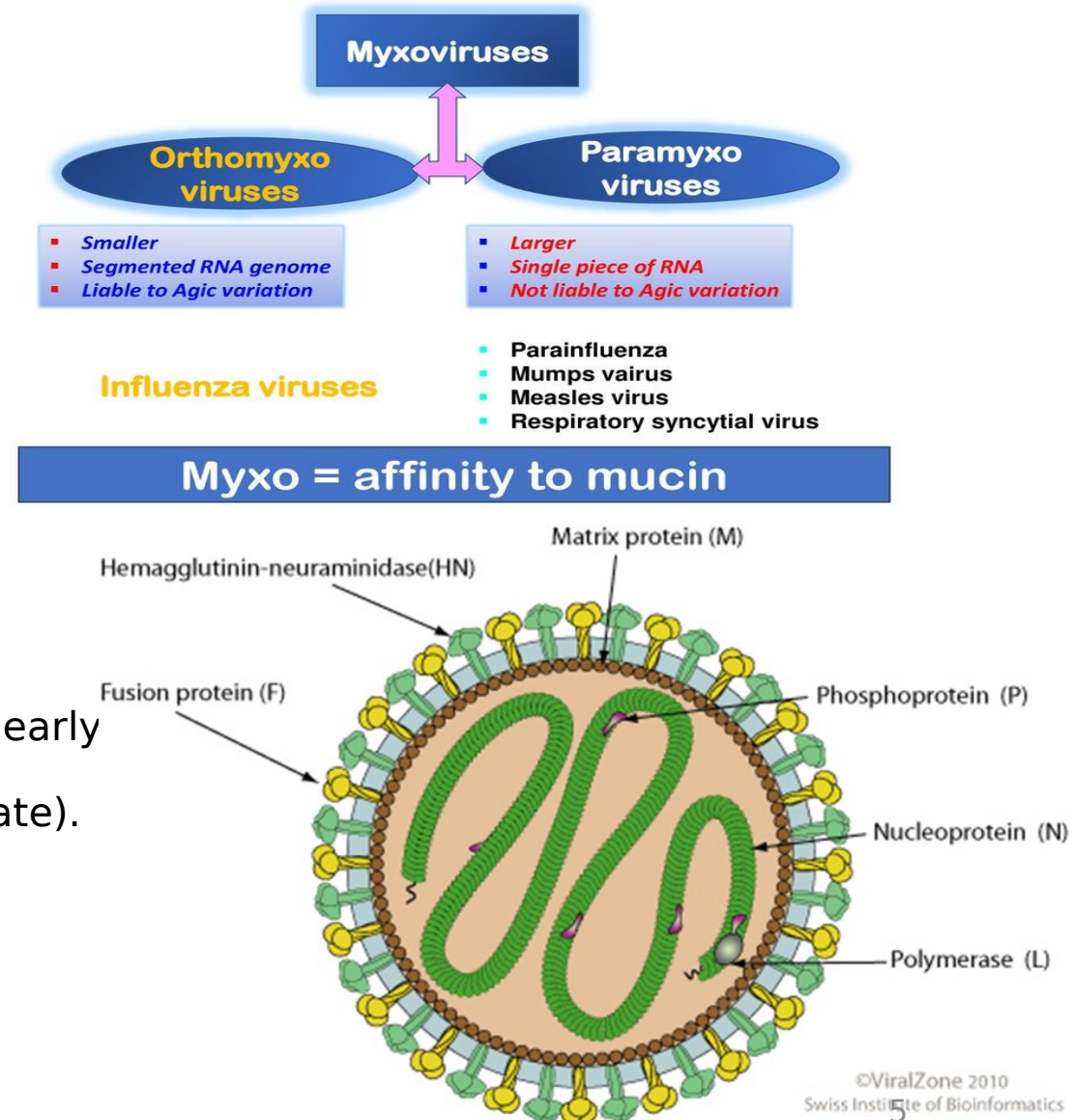
a.Haemagglutinin : attaching the virus to host-cell receptors(early

b.Neuraminidase : releasing new virions from infected cells(late).

2-Fusion protein

Fusing envelope with the host cell membrane

D-The virus has a single stable serotype

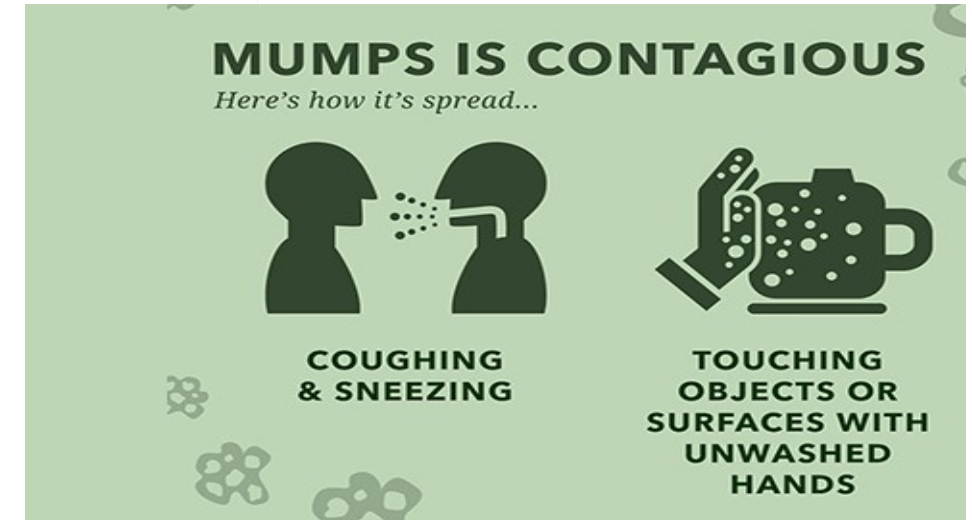


Mumps Virus



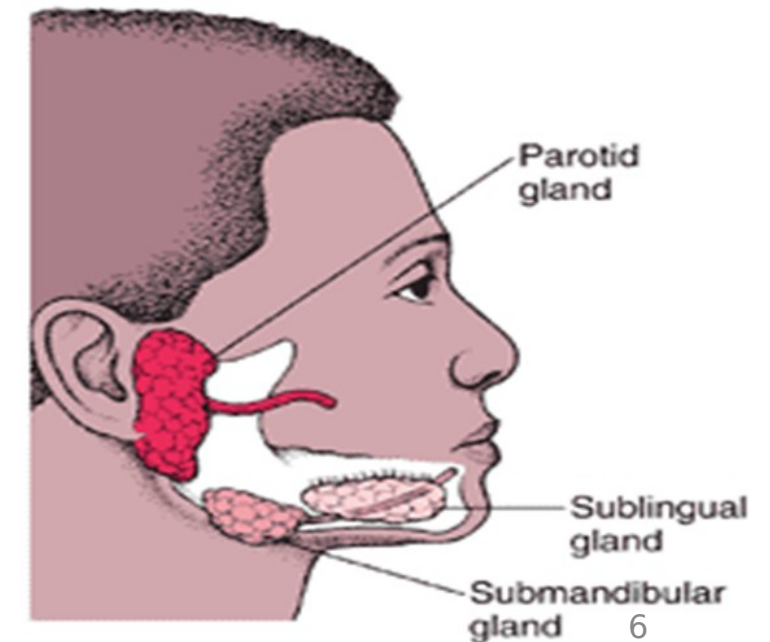
Pathogenesis

A-Source & mode of transmission



B-Infectivity

- Mumps is very contagious



Mumps Virus



C- Replication

1-1ry replication & Spread

□ In upper RT & LNs in neck

Viremia

Dissemination to :

a. Glandular tissues

Salivary glands, testes, ovaries, pancreas & kidney

b. Meninges

OR

□ Virus may **ascend** from the buccal mucosa

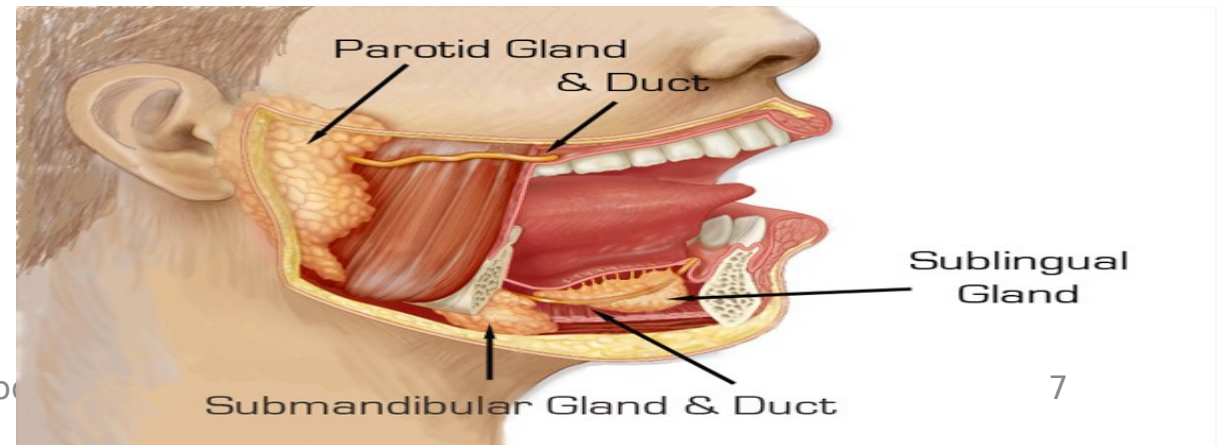
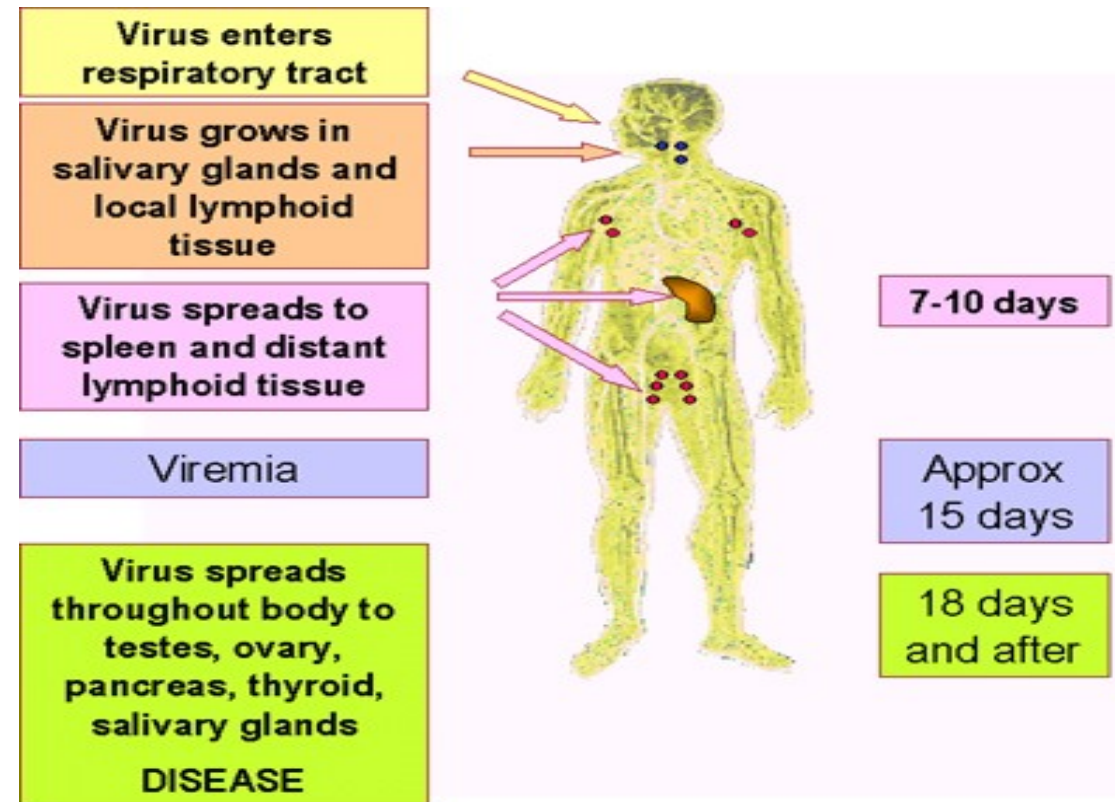
Stensen's duct

parotid gland

2-Site of virus

a. Blood & saliva : for 3-5 days after onset of disease

b. Urine : after 10 days



Mumps Virus



D-Immunity

- ❑ **Neutralizing Abs** are produced **against hemagglutinin**

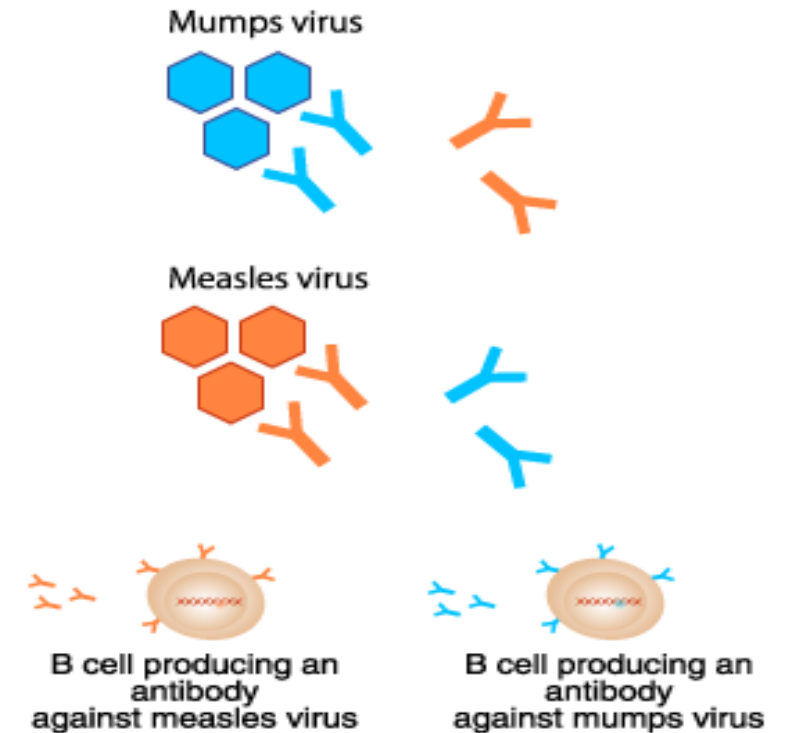


Life long immunity

- ❑ **Maternal IgG** crosses the placenta



Protection during **1st 6 months** of life



Clinical manifestations

Mumps : epidemic non-suppurative

A - Asymptomatic infections are common

B - Fever

C -Painful swelling & inflammation of one or both parotid

(other salivary glands may be affected)

D - Complications

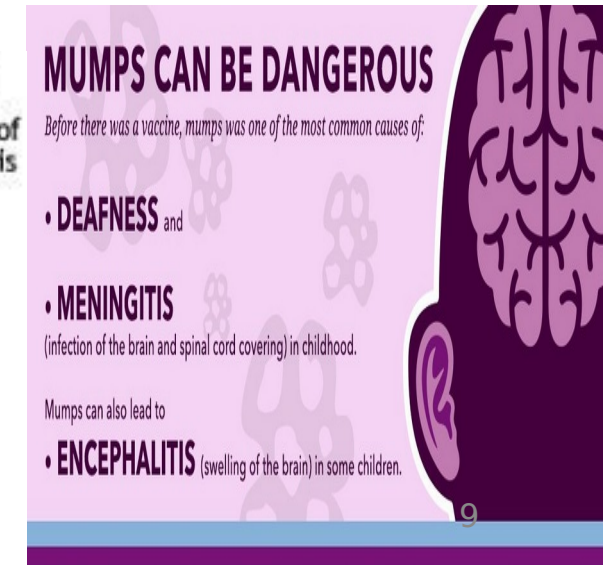
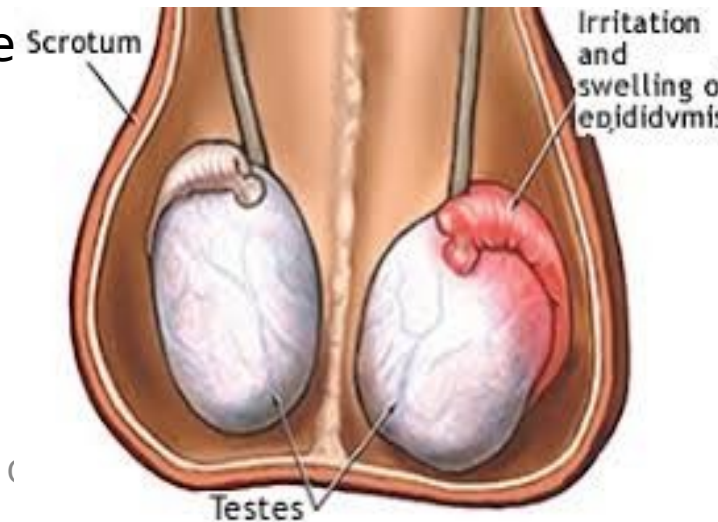
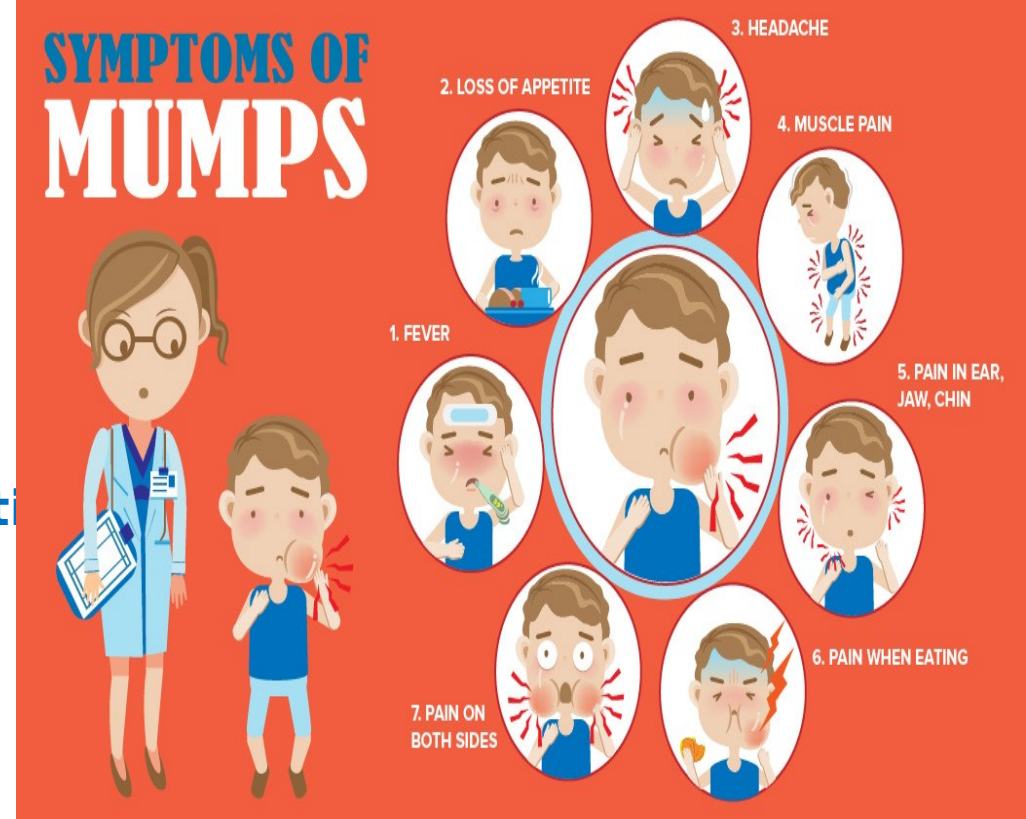
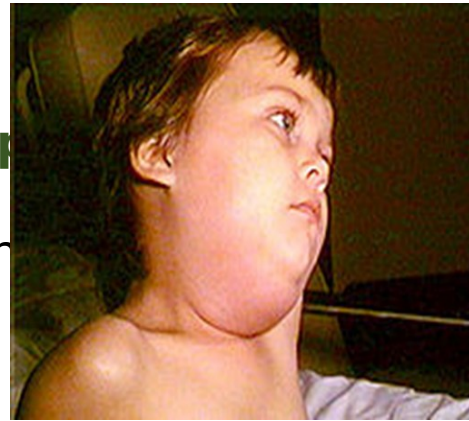
1-Aseptic meningitis

2-Postpubertal orchitis (Unilateral or bilateral)

May lead to **sterility** if bilateral

3-Oophritis

4-Pancreatitis



Mumps virus



Laboratory diagnosis

to differentiate between mumps and **other infectious (bacterial)**
non infectious causes (tumors, stones) of parotid enlargement

Specimen : Saliva, CSF & urine

1-RT-PCR

Detection of viral RNA

2-Virus Isolation

On tissue culture

3-Serology

a-Detection of **IgM** or **rising titer of IgG** against **S Ag**

b-Detection of **S Ag**

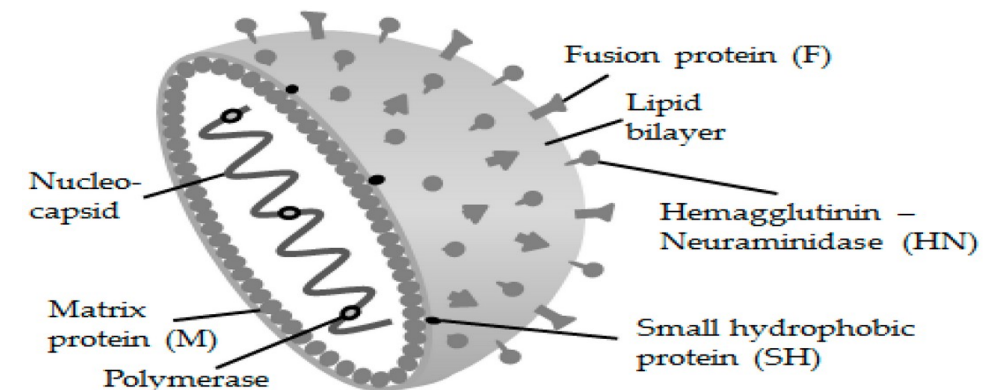
Laboratory Diagnosis

- **No Laboratory confirmation needed.**
- Atypical infection needs laboratory Diagnosis.
- Virus isolated from

Saliva
Urine
CSF.

Culturing in **Human amnion, He la cells.**

- **Detection of mumps RNA** by **PCR**
- **Serologic testing**
 - positive **IgM** antibody
 - significant increase in **IgG** antibody between acute and convalescent specimens



Mumps virus



Prevention

Age	Vaccines
12 months	MMR -1
4 years	MMR -2

It should not be given to immunocompromised persons or pregnant women.

Measles Mumps Rubella (MMR vaccine):



is a live attenuated vaccine grown in chick embryo





Question 1:

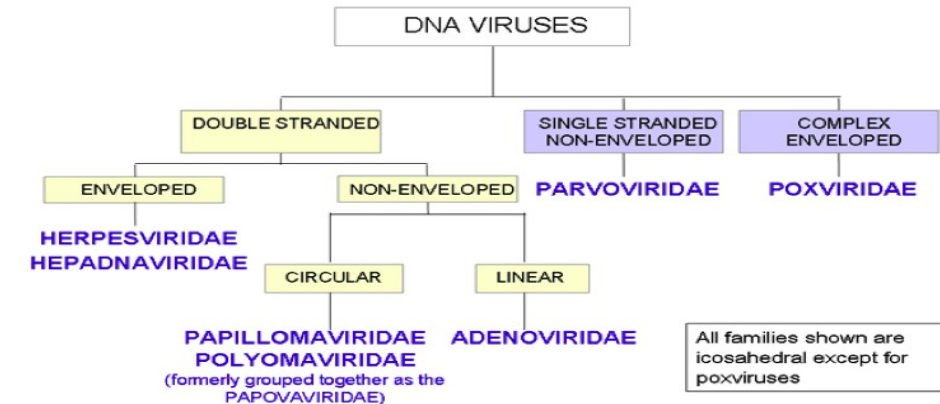
What is the mode of transmission of Mumps virus?

- a. Airborne
- b. Droplet
- c. Blood
- d. Sexual
- e. Feco-oral

Viral causes of gastroenteritis



	Acute watery (non-inflammatory) diarrhea
A- Cells in stools	No RBCs or WBCs i.e no inflammation
B - Fever	Afebrile
C - Volume	Large volume diarrhea
D - Site of inf.	Small intestine



E-Causative viruses

1- Rotavirus:

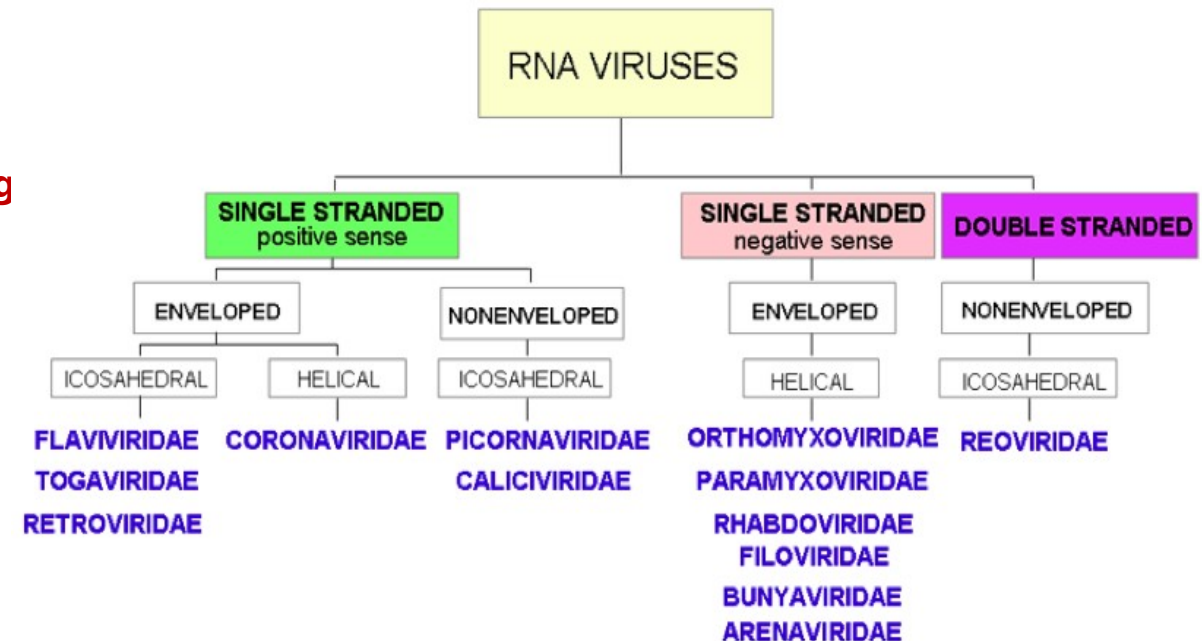
the most common cause of viral gastroenteritis in young

2- Norwalkviruses

3- Astroviruses

4- Adenoviruses type 40&41

5-Coronaviruses





Rotavirus

Structure

A- Family : **REO (respiratory enteric orphan) vi**

B-Nucleocapsid

1- **Segmented ds RNA : 11** segments

2-Icosahedral

3-**Double-layered protein coat**

Wheel shape appearance under EM .(hence the name)

4- **Type-specific Ag : Outer surface protein**

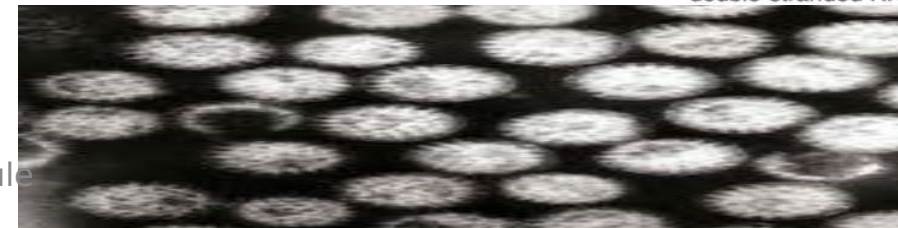
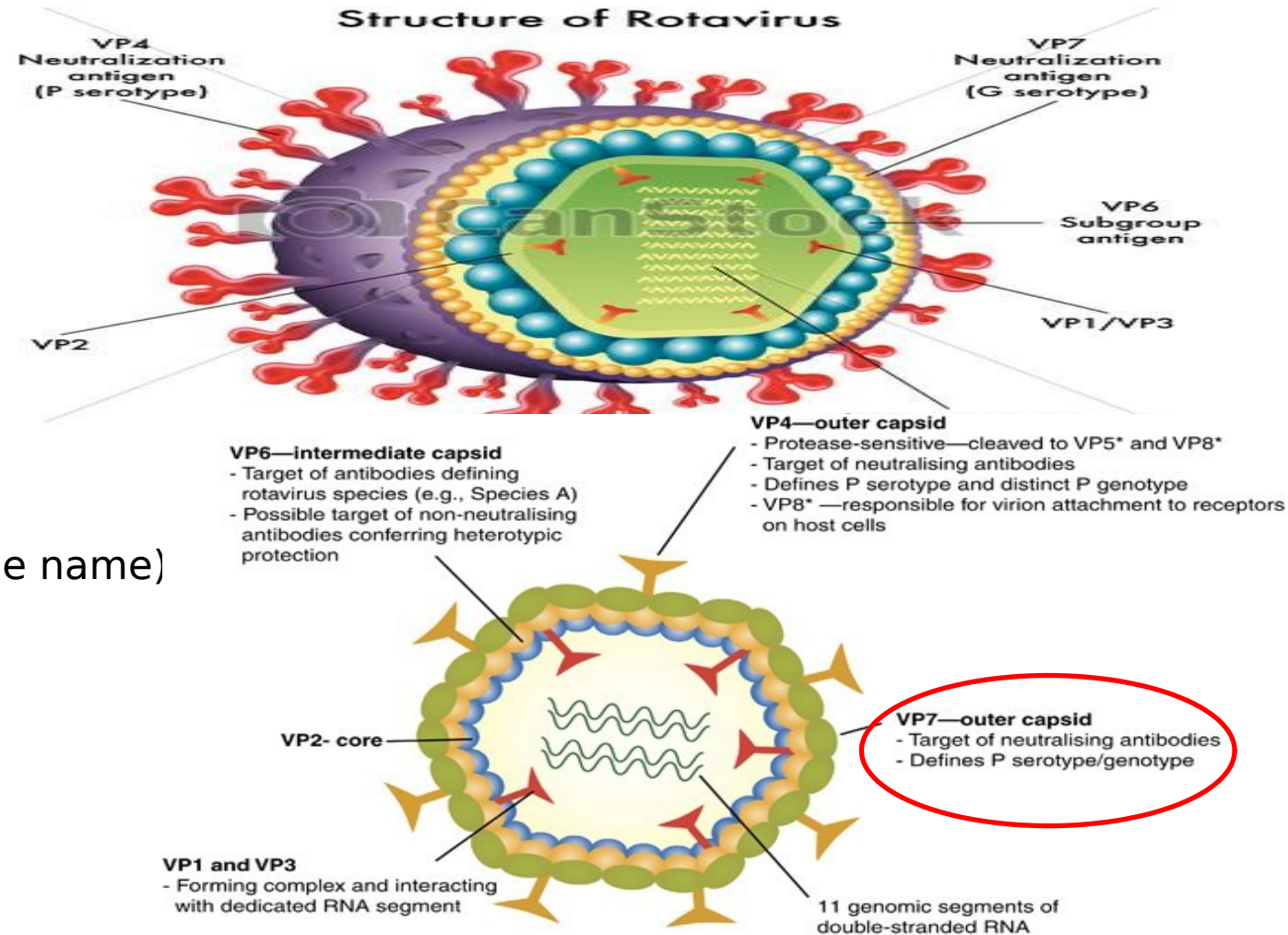
Target of neutralizing Abs

C-Non enveloped.

D-Animal strains

Many domestic animals are infected with their own strains,

but **aren't a source of human disease**



Rotavirus



Pathogenesis

A - Mode of transmission : Ingestion

⊛ **Feco oral:** Ingestion of contaminated food or H₂O

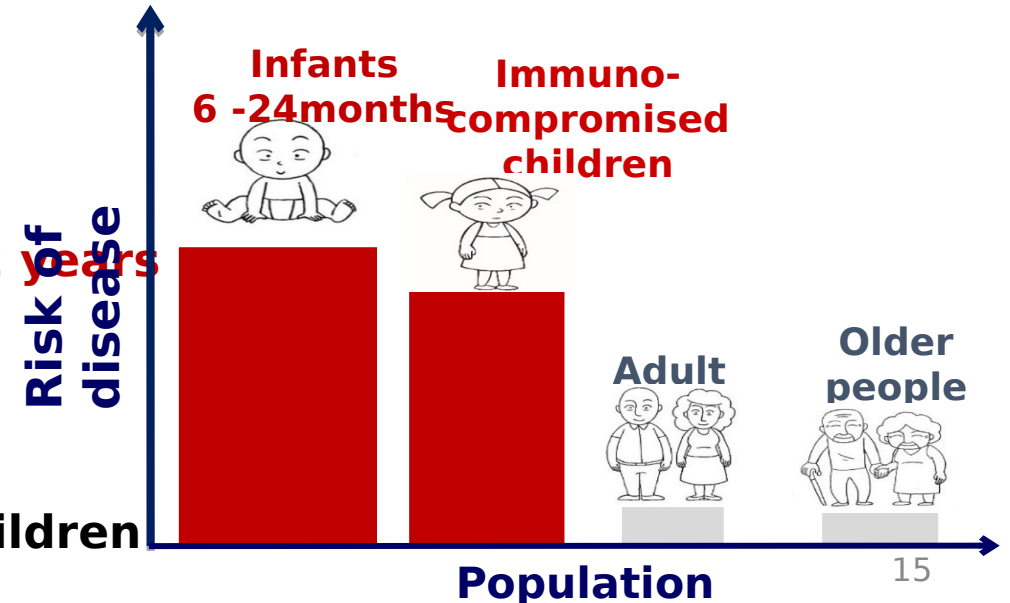
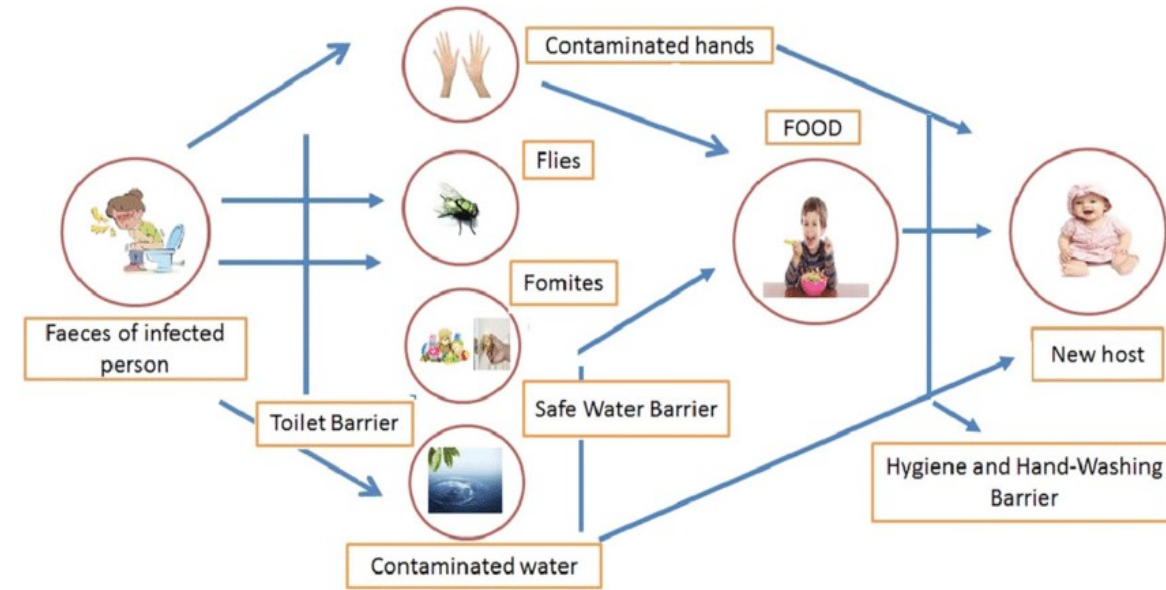
⊛ **Contact** with contaminated surfaces

⊛ **Nosocomial infection**

Outbreaks in daycare centers

B - Symptomatic infections

- **Most common in children between 6 months and 2 years**
- **Asymptomatic** in older children & adults
- May cause disease in **older immunocompromised children**



Rotavirus



C -Replication & Effect on cells

1-Virus attaches to the cell surface at the site of β adren



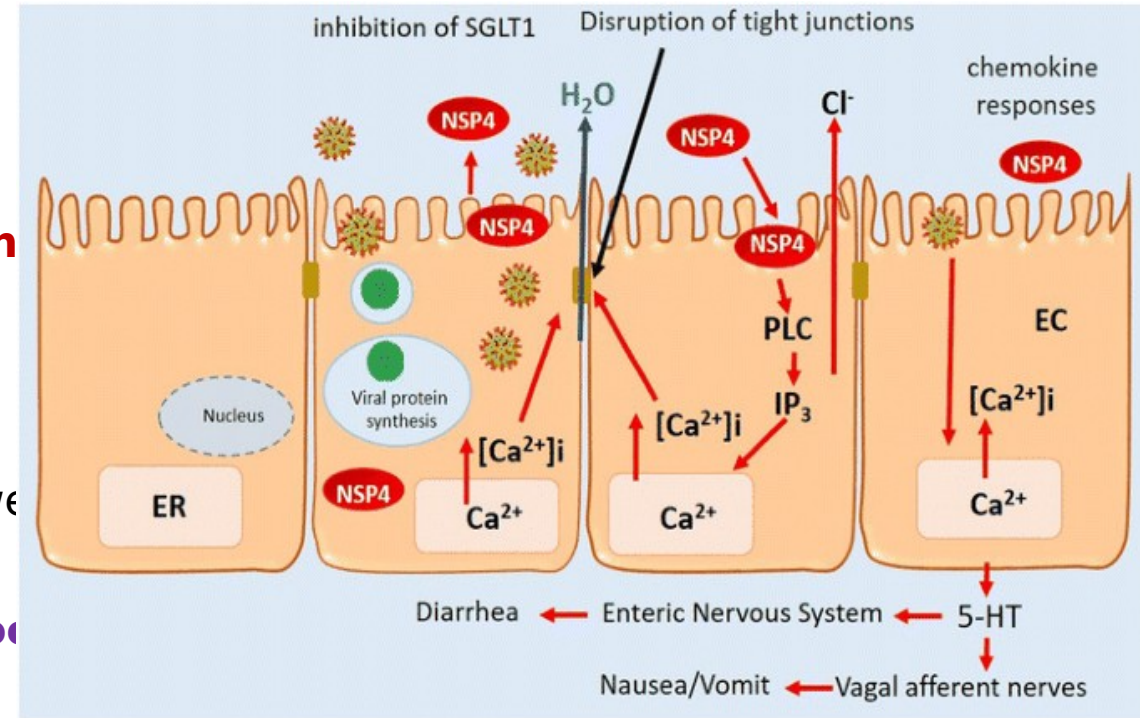
Replicates in the mucosal cells of **the small intestine,**



Excess secretion of fluids and electrolytes into the bowe



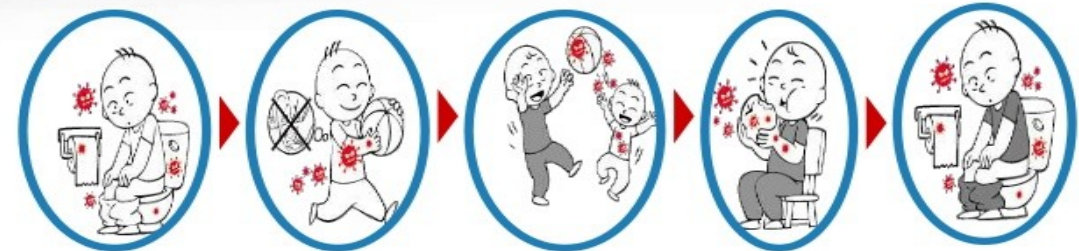
No inflammation occurs, and the diarrhea is non blo



2-Virus is excreted in large amounts in stools for 2

(prolonged in immunocompromised patients)

• Feco – Oral Route



- Rotaviruses are shed in very high concentrations ($>10^{12}$ particles/gram) and for many days in the stools and vomitus.



Rotavirus

D-Immunity

⊛ **Short lived immunity** → **Reinfections are common**

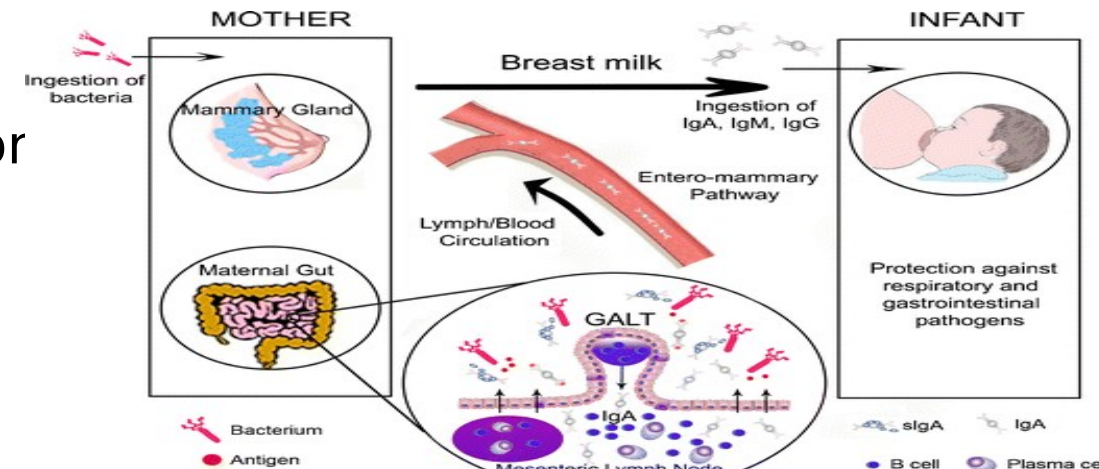
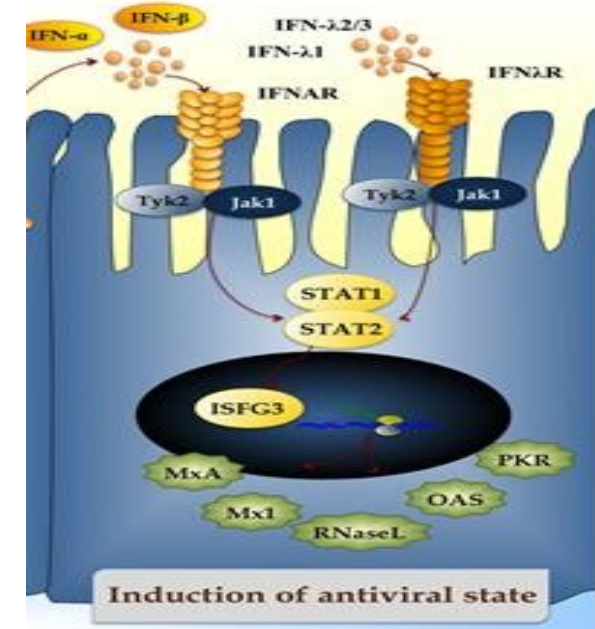
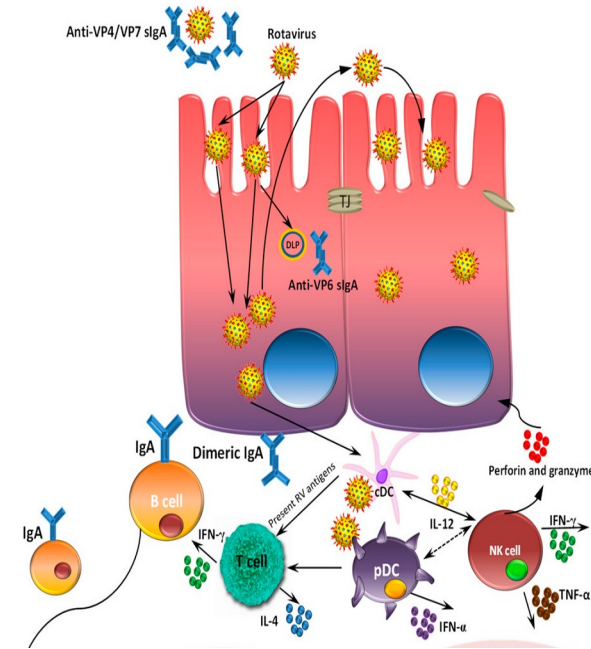
as it is mainly due to interferon α & secretory

rather than IgG

⊛ **Maternal sIgA in breast milk** protect infant in 1st 6 months

⊛ By the age of 6 years, most children have Abs

to at least to one serotype



Rotavirus



Clinical manifestations

Most common cause of infantile gastroenteritis

A -Three main symptoms of rotavirus infection:

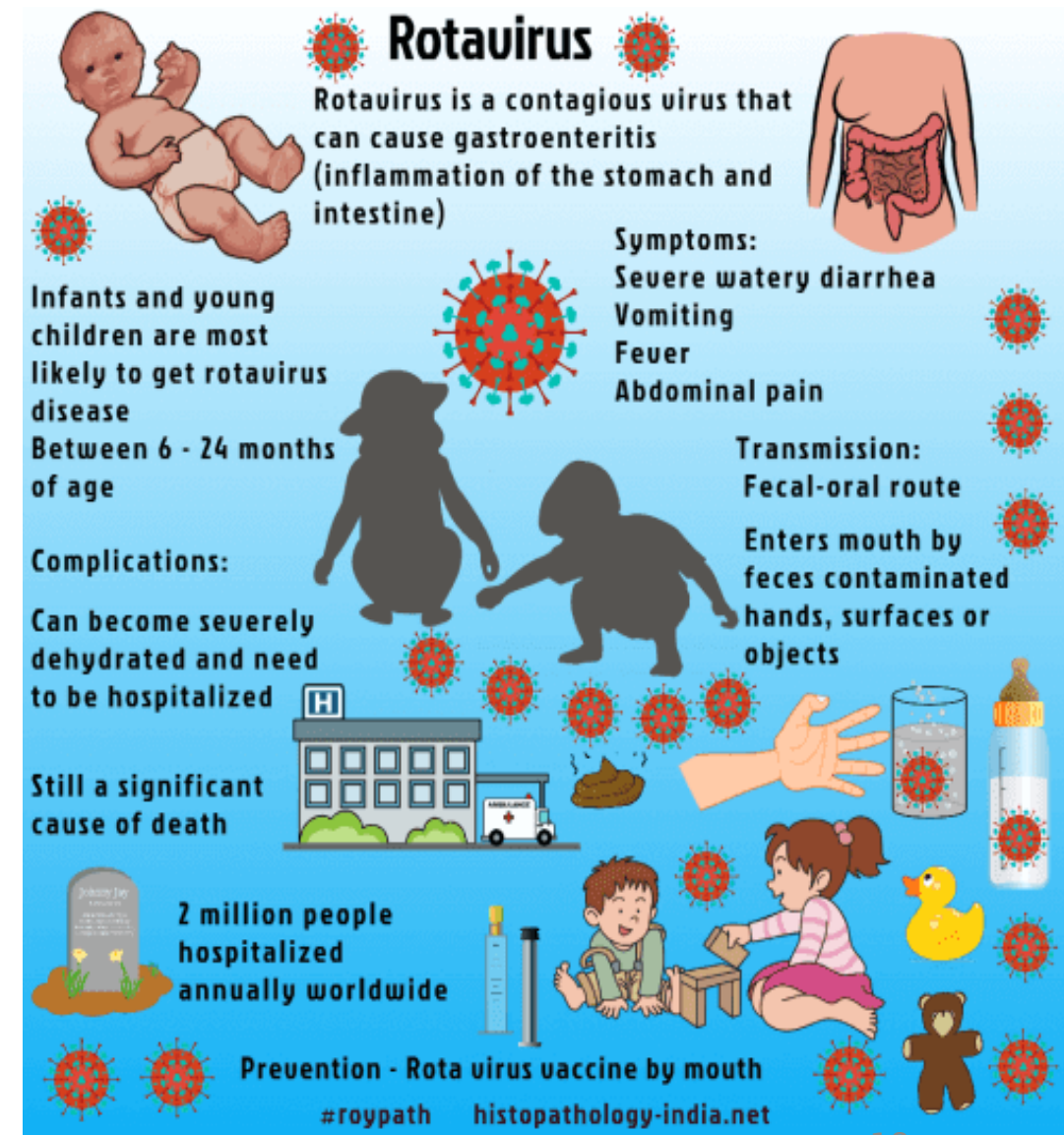
- Abdominal pain
- Vomiting
- **Severe watery diarrhea**

B - Complications

Dehydration & electrolyte imbalance

09/19/2024

GIT module



Rotavirus



Laboratory diagnosis

A- Lab Protocol

All stool or diarrheal fluid samples from children suffering from gastroenteritis should be tested for Rota virus infection

by ELISA rapid test for Ag detection

NB At the peak of infection ,as many as 10^{11} viral particles/ml stool can be present

B- Demonstration of wheel-shaped virus: by **EM**

C-Serology : ELISA

Rising Ab titer of IgG



Rotavirus

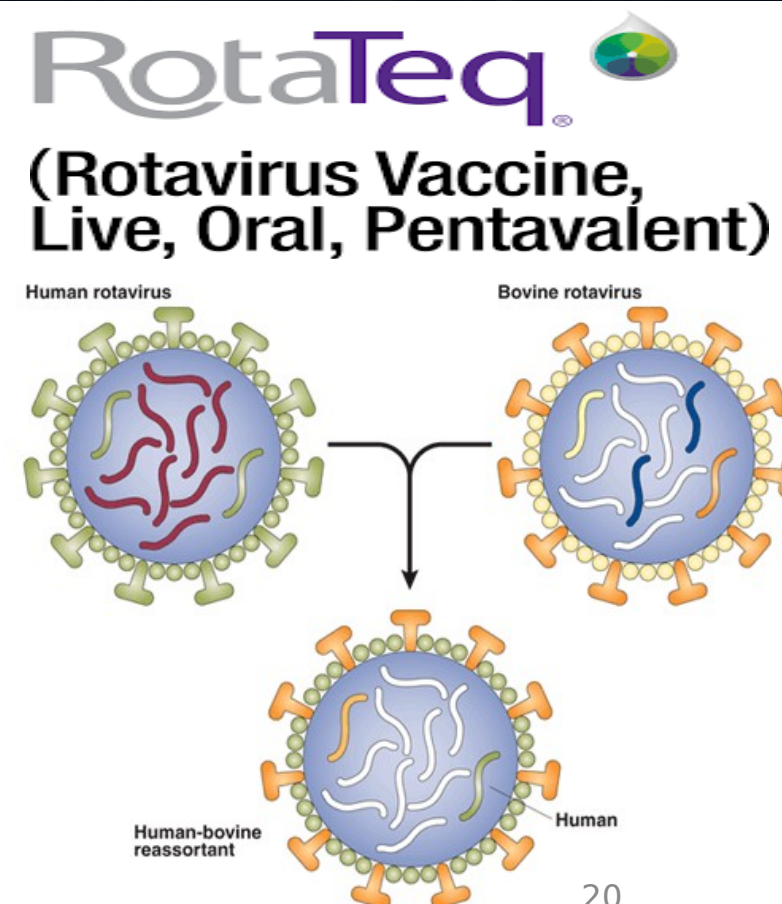
Prevention

A-Preparation

2 rotavirus live attenuated oral vaccines → given during early infancy

B-Types

Monovalent human vaccine (Rotarix)	Pentavalent human-bovine reassortant vaccine (Rotateq)
Contains the single most common rotavirus serotype causing disease	<p>Gene for outer surface protein of human strains is inserted into bovine strain (non pathogenic to human)</p> <p>Protective secretory IgA in GIT against the protein</p>





Question 2:

Rota virus should be screened in stool samples in which of the following groups?

- A. Pregnant females
- B. Infants and young children
- C. Neonates
- D. Elderly
- E. Adult males

Other Viruses causing gastroenteritis



1-Norwalkviruses

2-Astroviruses

3-Adenoviruses

Serotypes 40&41 cause infantile gastroenteritis

Structure:

A-Family : Calicivirus

B-Nucleocapsid :

- ss RNA
- Icosahedral

C - Non enveloped

Pathogenesis & Clinical manifestations

A- Mode of transmission :

Ingestion of **contaminated sea food or water.**

B- Disease

Most important cause of **epidemic gastroenteritis in adults,**
specially on cruise ships.

NOROVIRUS ***(Norwalk virus)***



Epidemiology

- ✦ Faecal-oral route [water, shellfish]
- ✦ Outbreaks of GE in schools, camps & cruise
- ✦ All age gps

Clinical features

- ✦ Children → vomiting [projectile]
- ✦ Adults → diarrhea

Diagnosis

- ✦ Viral Ag in stool by ELISA

Astroviruses

Structure

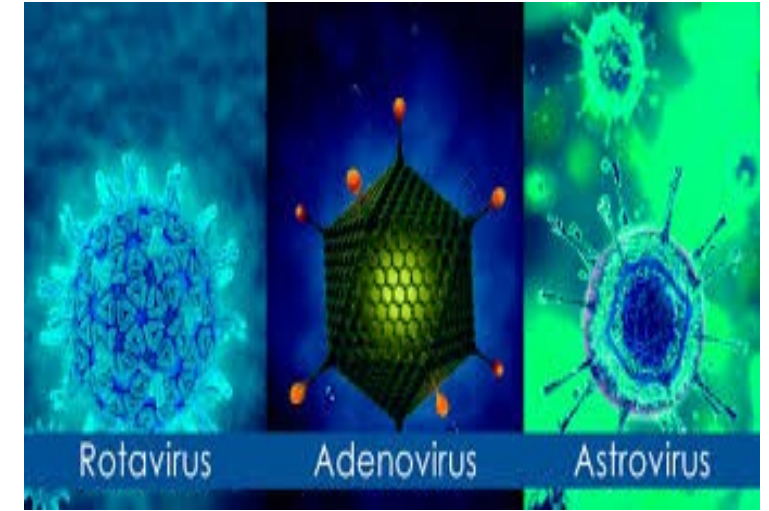
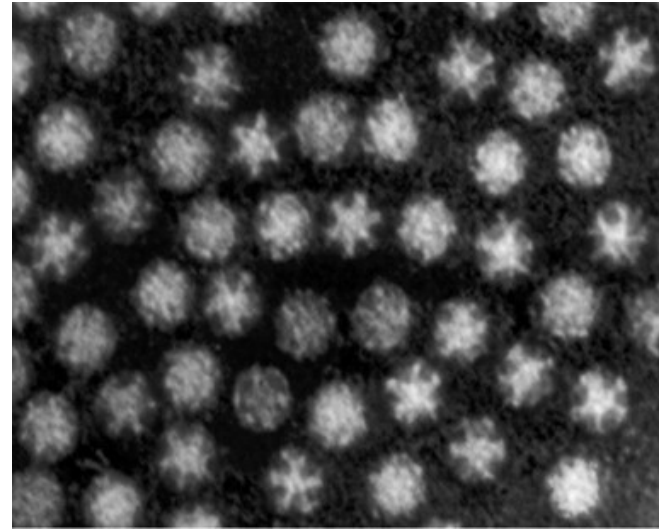
A - Nucleocapsid

- 1 - ss-RNA
- 2 - Similar to a **star in shape**.

B - Non enveloped

Clinical manifestations

Produce a disease similar to Rota & Aden
in neonates , young children and
immunocompromised persons



Astroviruses

- Astroviruses are nonenveloped RNA viruses similar in size to polioviruses.
- They have a characteristic five- or six-pointed morphology.
- **These viruses cause watery diarrhea, especially in children.**
- Most adults have antibodies against astroviruses, suggesting that infection occurs commonly.
- No antiviral drugs or preventive measures are available.



SUGGESTED TEXTBOOKS



***-Review of Medical Microbiology and Immunology,
Warren Levinson Chapters **39** RNA enveloped viruses ,
Chapter **40** RNA nonenveloped viruses***